

**Origin of Root Exudates: Diverse roots is why you have a diverse SFW.**

**What are Root Exudates?**

Chemical, Physical, Biological

Chemical composition of root exudates varies widely by plant species and root depth; its influence on microorganisms diverges between them. These compounds also vary widely by plant species and root depth.

(e.g., Root Exudates = AA, OA, CS, NAD, GF, WSV, EZ, OC.)

**Photosynthesis**

Liquid carbon pathway

$6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2$

Solar Energy → Chemical Energy

**Polysaccharide Proteins**

**Root Exudates**

**Variety of Compounds**

**Nature and amounts of exudates are dependent on plant species, plant age, inorganic nutrients, soil and air temperature, light intensity, moisture content,  $O_2/CO_2$  levels, plant health and soil health.**

**Greater populations of microorganisms exist near the roots; they decrease with distance and depth of the root system.**

**Amino Acids (AA):** Basic compounds of living cells in plants and microorganisms.

**Organic Acids (OA):** They increase available insoluble nutrients, metals, mobilization & transport of minerals

**Carbohydrates/sugars (CS):** is food for microbes, stimulate their activity and improve plant resistance to diseases and pests.

**Nucleic Acid Derivatives (NAD):** large molecules that carry genetic information (DNA & RNA).

**Growth factors (GF):** known as phytohormones; chemical messengers that regulate plant growth.

**Water soluble vitamins (WSV):** vary with plant species; aid in the nutrition of microorganisms.

**Other compounds (OC):** assist in plant health; in some cases they may attract, repel, or inhibit microorganisms

**Enzymes (EZ):** multi-protein complexes that aid catalyzing reactions that might not otherwise occur.

**The transition of energy, carbon and nutrient in a diverse system, help in optimization of the Dynamic Soil Properties.**

**Pasture and Range Health**

- Livestock integration/Adaptive grazing Mgt.
- Plant diversity
- Living roots throughout the year
- Cover the soil
- Less soil disturbance
- Rest/ Recovery
- Drought planning
- Monitoring
- Alternate season use

**Transitioning to a Soil Health System will take time, experience, patience & a Paradigm Shift in thinking.**

**Soil Food Web (SFW)**

SFW microbes feed on organic matter, root exudates & excretions.

**No Biology? No Benefit.**

**All trophic levels must be working for the SFW to function. Plants are the primary food producer.**

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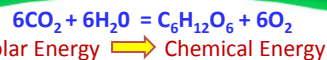
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Clarence Chavez 5/2014

## What are Root Exudates?

Liquid carbon pathway

## Photosynthesis



Root Exudates

Diversity of Pollen: Pollen attracts pollinators and other beneficial insects that affect plant growth (that in turn affects root exudates) by either conducting pollination or preying on herbivores and pathogens. These insects, when dead, provide food for decomposer soil biota.

Plant root exudates represent the direct effect of plants on soil health: root exudates alter the soil food web.

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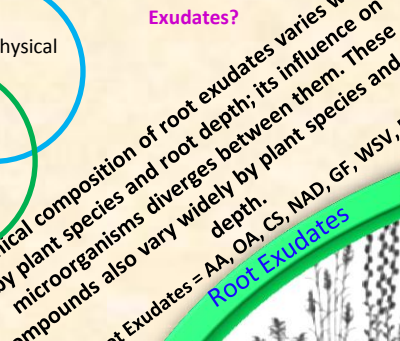
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A healthy soil is alive!



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